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EXPERIMENTAL STUDIES OF NATURAL PURIFICATION IN POLLUTED WATERS

NO. IX. NITRIFICATION IN SEWAGE MIXTURES[1]

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A previous publication (8) has shown that the adjustment of the various factors which may affect the rate and extent of a biological oxidation in a sewage mixture is not critical when observations are restricted to the first or carbonaceous stage of this purification process. Ample indications were obtained, however, that the specifications should be far more rigid in studies extending to the second or nitrification stage of a bacterial oxidation. In the first instance the work of oxidation is carried out by mixed cultures which, taken collectively, are adaptable to wide variations in pH adjustments and other factors affecting bacterial growth. In the subsequent stage of nitrification the oxidation process depends on the activity of highly specialized groups of organisms whose cultural characteristics must be carefully considered. Essentially, therefore, any study of nitrification even in such a heterogenous mixture as sewage, becomes a "pure culture" problem with all of the difficulties attending such work.

Among the variables which may affect a nitrification process are the nature and concentration of the mineral salts, the carbon dioxide tension, and the dissolved oxygen content. Except for conditions either of extreme deficiency or of abnormal concentration, these variables may be regarded as secondary in influence to the more important factor of pH. The discussion which follows will accordingly be limited largely to the effects of pH adjustment and control on the nitrification process.

EXPERIMENTAL PROCEDURE

The general plan of experimentation was to inoculate sewage mixtures buffered at various pH values, generally pH 6.0, 7.2, and 8.2,

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with nitrifying organisms acclimated to one or the other of these pH values. The sewage mixtures were prepared by diluting ordinary domestic sewage with the Clark-Lubs phosphate buffer solutions, suitably diluted, as described in previous work (7).

The cultures of nitrifying organisms were obtained by the repeated transfer of actively growing organisms to appropriate media buffered at selected pH values. While this procedure is not expected to give a pure culture in the bacteriological sense, it does assure a preponderance of nitrifying organisms acclimated to a particular pH value. Cultures of nitrifying organisms which were satisfactory at pH 6.0 were also obtained from the activated sludge plant at Rockville Center, where the pH value of the raw sewage is around 6.0.

LABORATORY EXAMINATIONS

The pH value of the experimental solutions was determined colorimetrically with frequent comparisons against the quinhydrone electrode. The course of nitrification was followed by determinations of nitrogen present as ammonia, nitrites, and nitrates, using more or less standardized procedures. The methods used in the determinations of dissolved oxygen and oxygen demand have been fully presented elsewhere (7). The Rideal-Stewart or permanganate modification of the Winkler method was used throughout.

Of the numerous analytical precautions to be observed, mention should be made of the necessity for using ammonia-free water for dilution purposes. Ordinary distilled water, especially where the chloramine process of water sterilization is used, may readily contain 0.2 or 0.3 parts per million of oxidizable nitrogen. Applying a factor of 4.6, this minute trace of nitrogenous impurity will lead to a huge error in the oxygen demand determination. The difficulty may not be avoided by the customary expedient of prolonged storage unless mineral salts and a growing culture of nitrifying organisms are also present.

The presence of free chlorine in distilled water may be expected under various conditions. The removal of this objectionable constituent is readily assured by the passage of the raw water through a filter of activated carbon prior to distillation.

Starting with raw sewage as a potential source of nitrifying material, erratic results may be obtained if a series of highly diluted subsamples is examined at the very onset of the nitrification stage. The difficulty here presumably arises from the paucity of the original seeding or from an actual diminution during the long period of inactivity which precedes the nitrification stage. Very satisfactory agreement between duplicates is obtained by seeding, as in the experiments reported in this paper, or by pooling and redistribution of the subsamples around the sixth day of incubation or just prior to the onset of nitrification. Resort to this artifice is also permissible as a

means of reaerating the subsamples in cases where the total disappearance of dissolved oxygen is indicated. If undertaken prior to the establishment of anaerobic conditions, this apparently heroic treatment is without effect on the rate and extent of oxidation during the first stage (8).

Following the general procedure which has just been described, the course of nitrification was followed, using sewage mixtures buffered at pH 6.0, 7.2, and 8.2. These mixtures were inoculated with a culture of nitrite-forming organisms which had previously been shown to be active at pH 8.2. The pH value of the sewage was 7.2, and, as it was not sterilized, nitrification was also to be expected at that pH value.

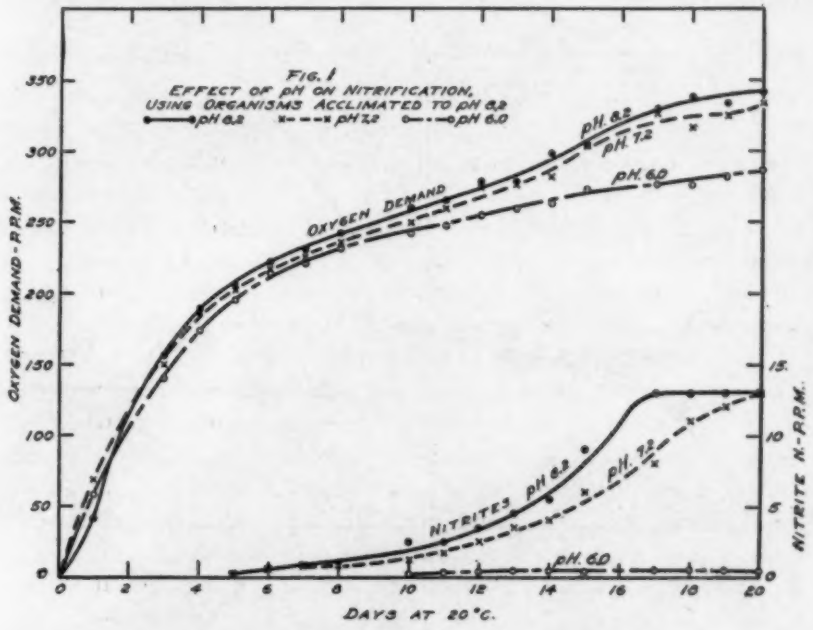

FIGURE 1.

The results are shown in figure 1, in which the oxygen demand and the nitrite data are plotted against the period of incubation in days at 20° C. The oxygen demand results are somewhat the same during the first 7 or 8 days prior to the onset of nitrification. Thereafter the most vigorous oxidation was obtained at pH 8.2, although the results at pH 7.2 are but slightly lower. At pH 6.0, however, nitrite formation had not proceeded to any appreciable extent after 20 days of incubation at 20° C. This is in line with the repeated observation that the nitrifying organisms in sewage may not adapt themselves to such a relatively small change as one pH unit, even in the course of 10 to 20 days of incubation.

These experiments were repeated under identical conditions, except that the inoculation consisted of a nitrite culture growing actively at

pH 7.2 instead of 8.2. The sewage used in this experiment was collected from another source and possessed a pH value of 8.0. As shown in figure 2, the results are again in reasonably close accord during the first, or carbonaceous, stage of oxidation. After 7 or 8 days, however, nitrification was in active progress and all agreement ceased. The most vigorous oxidation was obtained at pH 7.2, corresponding to the pH value of the actively growing culture added as inoculum. The nitrification process was somewhat delayed at pH 8.2, and it proceeded still more slowly at pH 6.0 These peculiarities of the oxygen demand curves (upper curves) are reflected in the direct

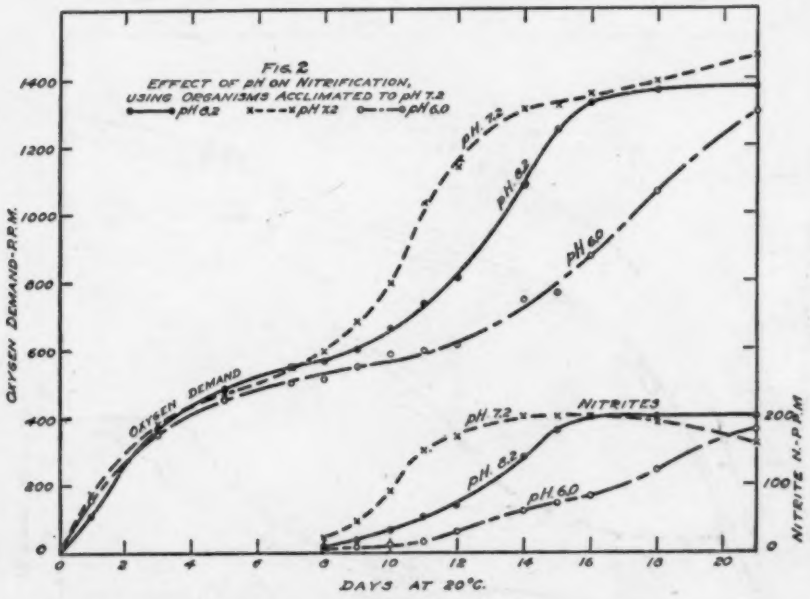

FIGURE 2

observations on nitrites, which are shown in the lower part of figure 2. The formation of nitrates was greatly delayed in this experiment.

In completion of these observations on the effect of pH on nitrification, a third series of experiments was undertaken, in which the inoculum consisted of a mixed culture of both nitrite- and nitrate-forming organisms which had been acclimated to pH 6.0. In previous experiments no attempt was made to add nitrate-forming organisms. The pH value of the sewage itself was 7.2. In other respects the experimental conditions were unchanged. As shown in figure 3 the agreement in oxygen demand results was excellent during the first 8 or 10 days of incubation. Beyond the tenth day the interpretation of results is complicated by the fact that the production of nitrates and nitrites proceeded simultaneously at pH 6.0 and 7.2.

At pH 8.2 nitrate formation was delayed until the fourteenth day. The nitrite figure at pH 8.2 accordingly reached a higher value than at 6.0 or 7.2.

The expectancy that the rate of nitrification at pH 6.0 would be as high as at 7.2 was only partly fulfilled in this experiment. It is significant, nevertheless, that nitrification did proceed at pH 6.0 at a satisfactory rate, whereas in other experiments at the same pH value

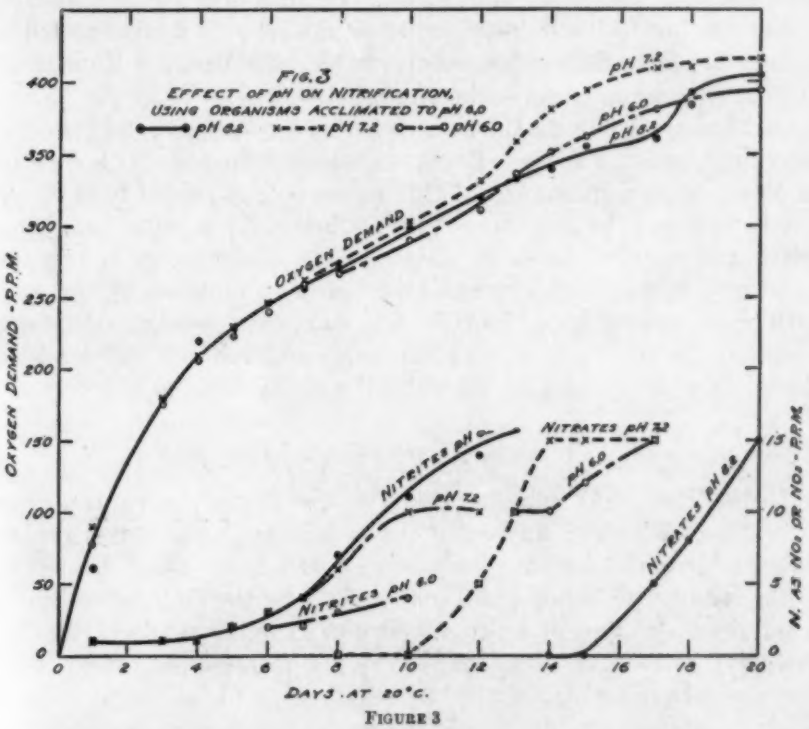

FIGURE 3

nitrification was either practically nil, as shown in figure 1 or else greatly retarded, as shown in figure 2.

A further point of interest is that nitrate formation, under the influence of the added inoculum, did proceed at all three pH values in sharp contrast with the results presented in figures 1 and 2.

DISCUSSION OF RESULTS

There is nothing in the early part of the deoxygenation curves presented in figures 1–3 to indicate the wide variations in oxygen consumption which may occur after 8 or more days of incubation under standardized conditions. With a knowledge of the pH values of the sewage itself, of the dilution water, and particularly of the inoculum, the results are readily interpretable, proper allowance being made for the inoculation present in the sewage. The pH value of

the dilution water should be suitably adjusted if concordant results are to be expected in studies of biological oxidations which extend into the nitrification stage.

It is noteworthy that the addition of nitrifying organisms in active growth did not induce nitrification from the start but only after an incubation period of a week or more at 20° C. The delay in nitrification, therefore, is to be attributed not to a lag occasioned by the presence of attenuated cultures, or even to a scarcity of nitrifying organisms, but to the well-defined effect first clearly demonstrated by Adeney (1) for sewage mixtures and later generalized by Kendall (3) as the "sparing action of carbohydrates."

Carbon, as carbon dioxide, nevertheless appears to be an essential ingredient in the diet of nitrifying organisms. In work with a simple medium, using ammonium chloride as the sole source of food, it was found necessary to prepare a buffer solution from potassium phosphate and sodium carbonate instead of the customary phosphate-hydroxide buffer. This precaution becomes unnecessary in work with raw sewage, as carbon dioxide is always present in relative abundance as a result of the preliminary oxidation of carbonaceous materials which invariably precedes the nitrification stage.

APPLICATION TO SEWAGE TREATMENT

Phelps et al. (6) call attention to the seemingly contradictory claims for the beneficial effect of either lime or acid as correctives for the troublesome "bulking" of activated sludge. Thus, Donaldson (2) has controlled bulking at Tenafly, N.J., by the addition of lime to maintain a pH value of 8.6 to 8.8 for 6 to 12 hours, while Mieder and Viehl (4), at Leipzig, Germany, have obtained good results by maintaining a pH value of 6.5 with hydrochloric acid. On the basis of other results reported by Viehl (10) and of the data presented in this paper, it must be concluded that nitrification should be impeded by such measures if the normal pH value of the sludge-sewage mixture is around 7.5. In effect, the supply of dissolved oxygen should be temporarily increased and, as claimed by Townsend (9) and others, the settling characteristics of the sludge should improve. Further experimental test of these views is now in progress. A small activated sludge plant is being used for the test.

There is warrant for suggesting improper pH adjustments as a reason for the discordant results reported in well-sponsored investigations of the oxygen requirements of sewage plant effluents. Such an explanation would seem particularly applicable to cases where comparisons have been made of the effect of various dilution waters on the rate and extent of oxidation of partly nitrified effluents or of effluents which are just entering the nitrification stage.

In this connection it is tempting to suggest that extraordinary claims for reductions of 50 parts per million and more, in the oxygen requirements of samples treated with 1 or 2 parts per million of free chlorine, may be due either to the absence of nitrifying organisms in the seeding which must necessarily be added, or to the use of a dilution water adjusted to a pH value which does not permit the growth of the added inoculum. This double hazard should also be encountered in examinations of effluents partly sterilized by the recently revived processes of chemical precipitation.

Other discordant or patently improbable results with partly purified effluents might profitably be examined from this angle. These experimental difficulties in the evaluation of the efficiency of sewage treatment processes are due primarily to the extension of the oxygen demand test into regions far removed from its original use as a measure of stream pollution. In tests of raw sewages which are restricted to the customary 5-day period of incubation, it must be concluded with Mohlman (5) that "a careful study of the results will indicate that the discrepancies are usually due to sampling errors, errors in the technique, or the presence of germicidal substances in the sample."

SUMMARY

Nitrification in sewage mixtures, even with an inoculum of known nitrifying organisms, does not proceed to an appreciable extent until after approximately a week of incubation at 20° C.

Erroneous results may be obtained in evaluating the performance of sewage treatment processes if complete reliance is placed on the limited seeding of nitrifying organisms normally present in raw sewages, especially in partly sterilized or chemically treated samples.

The pH value of the dilution water should be roughly adjusted to that of the established optimum for the prevailing nitrifying organisms when partly nitrified effluents are examined.

A possible reconciliation is suggested for the apparent conflict in claims regarding the use either of acid or lime as correctives for the bulking of activated sludge.

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THE ACTUAL CAUSES OF DERMATITIS ATTRIBUTED TO SOCKS

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Cases of dermatitis from the wearing of different articles of clothing have been reported from time to time. In nearly all of these cases either the dye was blamed or no attempt was made to ascertain what substance in the article of clothing actually caused the dermatitis.

Three of the four cases reported in this paper show that the dye is not always at fault, and that it requires careful investigation to determine the actual substances which cause the dermatitis.

CASE NO. 1

In 1931, a clerk in the office of a large rubber concern reported to the writer that he had a dermatitis on his feet which had developed a few days after wearing a new pair of dyed socks. An examination of his feet showed parallel lines of dermatitis running across the dorsum of the foot and above the ankle over an area corresponding to the body of the stocking. These lines of inflammation corresponded to a certain stripe in the multi-colored rayon body of the socks. The toe, the heel, and the top of the socks were made of cotton and dyed black, and the parts covered by them were not affected. No further study of the case was made, but in this instance the dermatitis was probably due to the particular dye in the cross stripe.

CASE NO. 2

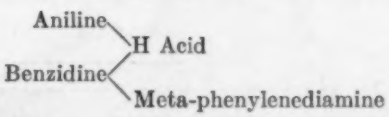
In November 1933 there came to my attention a case of dermatitis which developed after the wearing of new socks. The patient, Mr. C., age 57, had bought a dozen pair of socks in June 1933 and had worn a fresh, unwashed pair each day for 4 days. At the end of that time he noticed that his feet began to itch and that a fine, erythematous rash had developed on his feet and up his legs as high as the socks reached. His physician, who said that the dermatitis was probably due to contact with the socks, advised him to discontinue wearing them and to apply a mild salve. Within a week the rash had disappeared.

This patient stated that he had worn black socks for many years and never had such trouble before; that he had had no skin diseases of any kind, but that he gets a roughness on the back of his hands during the winter, and that his skin is sensitive to soap and to ivy. He never develops any skin rashes from eating food. He had been subject to hay fever about the 1st of September of each year until 10 years previously, since which time he had been free from it. At the time that he developed dermatitis, he suffered from a mild asthma.

When I first saw the patient, in November 1933, there were no signs of any dermatitis on his feet, and no cracks or desquamation between the toes. He brought with him a pair of the socks which had not been worn. They consisted of a black rayon body with black cotton tops, toes, and heels. He was "patched" with a piece of the cotton top of the sock and with a piece of the rayon body. The patches were left on for 48 hours, at the end of which time there was no reaction under either of the patches. He reported back 3 days after the patches had been removed and stated that on the evening when the patches were removed the skin at the site of the patches began to itch and later became reddened and inflamed. The degree of inflammation increased and reached its height about 48 hours after the removal of the patches. At the time when he reported, the third day after the removal of the patches, the skin where they had been placed was red, edematous, and studded with small vesicles.

DYE TESTS

An examination of the socks showed that the dye used in the body was identical with that used in the top. The socks were dyed in the piece with a direct black having the following formula:



This black is extensively used for the dyeing of wearing apparel; about 60 million pounds of it are sold annually in the United States. It ran off the socks, or as it is technically termed, "bled", easily when the socks were soaked in water. Because of the extensive use of this direct black, and the fact that cases of dermatitis caused by it have not been reported, it was thought that perhaps the particular batch of dye used for dyeing these socks was of poor quality, or that perhaps the process of dyeing was imperfect. In order to see whether proper dyeing with a good quality of the same direct black would cause a dermatitis on the patient, and also to determine whether he was sensitive to other blacks, four pieces of rayon were dyed black in the following manner.

1. *Direct black.*—Seven percent of direct deep black powder was dissolved in boiling water. A piece of rayon of sufficient weight so that the amount of dye was 7 percent of the weight of the rayon was scoured with soap and soda ash to remove the oil which usually remains from the coning and spinning process, and also to remove whatever fugitive dye remained in the rayon. It was then rinsed in water to remove the soap and soda ash, after which it was immersed in a solution of sulphonated oil in order to help the dye to penetrate the fabric better. (Soap or a detergent may be used for this purpose. If soap is used, sufficient is added to make a 1- or 2-percent solution.) The rayon was then

immersed in the dye bath. After it had been in the dye bath for 10 minutes, a 20-percent solution of Glauber salt was added. (This serves to drive the color into the fabric.) It was allowed to stay in for another half hour, then taken out, rinsed in water, and dried. The amount of liquor actually in the dye bath was about 20 times the weight of the dye.

2. *Zambesi black.*—Zambesi black is a developed black. After the rayon had been prepared in the same manner as for the direct black, Zambesi black solution was prepared by adding to a small quantity of water 7 percent of Zambesi black by weight, compared to the weight of the rayon to be dyed. The rayon was then entered into the dye bath and after 15 minutes Glauber salts were added. It was kept in for another half hour, then rinsed in cold water and diazotized for 20 minutes in a bath charged with 3 percent nitrite ($NaNO_2$) and 10 percent hydrochloric acid. It was again washed and immersed in a developer bath consisting of 1½ percent of metatoluene diamine for 20 minutes, again washed in cold water, and dried.

3. *Sulphur black.*—The rayon was prepared as previously described for dyeing. Katagen deep black powder was taken, 10 percent by weight of the powder to the weight of the rayon. Ten percent of sodium sulphite (Na_2S) by weight of the goods was added, and 5 percent of soda ash. To this mixture four times the amount of water was added and boiled for 10 minutes. This gave a uniform solution, to which sufficient water was added to make 20 parts of water to 1 part of the dye. The material was then entered in the dye bath, and after 20 minutes Glauber salts were added in the amount of 30 percent of the weight of the material. It was then kept in for another hour, rinsed in water, and dried.

4. *Aniline black.*—Three solutions were prepared, as follows:

Solution A	*Parts*
Aniline salt	88
Aniline oil	5
Water	300
Solution B	
Sodium chlorate	35
Water	300
Solution C	
Potassium ferrocyanide	65
Water	200

Solutions A, B, and C, were mixed, and when cooled were strained through a piece of white cloth. The material was entered and kept for 5 minutes, cooled. It was then taken out and squeezed dry and steamed for 2 or 3 minutes, after which it was washed and soaped to complete the aging and to remove the excess color. If the color was not sufficiently deep, the material was immersed in a potassium bichromate bath and then rinsed again.

Mr. C. was "patched" on January 8 with five pieces of black dyed rayon, as follows:

1. With the piece of black dyed rayon of the sock which caused the dermatitis.
2. With a direct deep black, unfinished.
3. A sulphur black, unfinished.
4. An aniline black, unfinished.
5. Zambesi developed black, unfinished.

The patches were left on for 72 hours and were then removed. The skin under the sock patch showed an erythema, papules, and beginning vesicles. The patch from the sulphur black showed a milder erythema and a few papules. The skin under the Zambesi black patch showed no reaction. The skin under the patch from the unfinished direct black showed a depression from the pressure of the silk, but otherwise no reaction. The skin underneath the aniline black patch also showed a depression but no reaction.

At this time the results of the patch test showed that while the patient was sensitive to the direct black on the socks and to the sulphur black, he was not sensitive to the same direct black properly dyed and unfinished on a piece of rayon similar to that from which the sock was made. When he returned the next day for observations as to late reactions, the site of the dyed sock patch showed erythema, edema, and vesiculation. The site of the sulphur black patch showed erythema and edema. The site of the aniline black also showed an erythema and edema. There were no reactions at the sites of the Zambesi and the unfinished direct black patches. Observations made later showed that no reactions developed at the sites of the Zambesi black and the unfinished direct black patches.

These tests indicated that it was not the direct black or the rayon on the socks which caused the dermatitis. They also showed that the patient was sensitive to sulphur black and aniline black, both of which contained some alkali; the sulphur black had 5 percent soda ash in the dye bath and the rayon dyed with the aniline black received a final treatment of soap. As the sulphonated oils used in the finishing process on socks are often alkaline, the possibility presented itself that the finish on the socks might be the actual cause of the dermatitis.

STOCKING "FINISHES"

Finishes are used on stockings in order to soften the fibres. Finishes on men's socks usually consist of sulphonated oils or fats. Finishes are also used to "scroop" a stocking (to give it a crunchy feel), this quality being desired by the trade. "Scrooping" is done by treating the material in soap or sulphonated oil with the addition of an acid, like acetic, formic, or tartaric. The addition of these acids to the soap causes the soap to form the acid of the fat from which it is made, and this fatty acid is left as a deposit on the material. "Scroops" are usually put on ladies hosiery.

Ladies hose are also finished with starches, gums, and gelatins, and delustered with inorganic salts and treated with waxes and paraffins for water-repellant properties. Some of the delustering agents are zinc sulphate, barium sulphate, aluminum sulphate, and titanium oxide. Some of the waxes are paraffin, japan wax, and beeswax.

In the case of wool stockings, sulphonated oil finishes are used to "loft" and revive the wool—that is, to fluff it up.

The finishing oils used are sulphonated castor oil and sulphonated olive oil. These may be mixed in certain proportions with mineral oils or with unsulphonated oils.

The place where the socks in question were made and finished was found, and the method and finishes used were ascertained. They were dyed and finished in the same bath. The amount of the finish used was 10 percent of the weight of the goods. After the socks were taken out of the dyeing machine they were rinsed with water and immediately immersed in a solution of olive bead flakes and then dried. Two finishing oils were used on the socks, one consisting of sulphonated castor oil plus borax, and the other called Sulphoricinol S, the exact composition of which could not be obtained from the manufacturer. Sulphoricinol S is markedly alkaline to litmus, and it probably consists mainly of sulphonated castor oil.

A chemical examination of the fabric of the stocking showed that it had an oil content of 1.12 percent, and that the fabric was alkaline in reaction, having a pH of 7.8. There was no copper or chrome present.

In order to determine whether it was the finish on the socks which actually caused the dermatitis, 3 pieces of the unfinished direct black dyed rayon were taken, and 1 piece was immersed in a solution of Sulphoricinol S in the strength of 1 part of Sulphoricinol S to 3 parts of water; another piece was immersed in a solution of the other finishing oil (which consisted of sulphonated castor oil plus borax) in the same dilution; the third piece was immersed in 1-percent solution of olive oil soap. All 3 pieces were wrung out so that they were only damp, and placed on the patient's arm in the form of patch tests and left on for 72 hours. At the end of that time the skin under the Sulphoricinol S patch showed an erythema and a few papules, but there were no reactions under the other two patches. Forty-eight hours later the skin where the Sulphoricinol S patch had been showed an area of erythema with scaling. The site of the patch of the other finishing oil (which had shown no reaction at the time when the patch was taken off) now showed an erythema and scaling not as marked as the site of the Sulphoricinol S patch. The site of the 1-percent solution of olive chip soap patch showed a milder erythema. The patient complained of considerable itching at the site of the Sulphoricinol S patch. These tests showed the patient to be markedly sensitive to the Sulphoricinol S; sensitive, but in a lesser degree, to the other finish; and slightly sensitive to 1-percent solution of olive chip soap. They proved that it was the finish on the socks and not the dye nor the material which caused the dermatitis.

As a further check, Mr. C. was told to wash one of the socks in soap and water, rinse it in clear water, dry it, and wear it for a number of days. The washing would remove the finish, and if no dermatitis developed, it would constitute additional evidence that it was the finish and not the dye or the rayon which caused the trouble. Mr. C. did this and no dermatitis developed.

CASE NO. 3

While the investigation was under way, one of the chemists working at the chemical company where the analyses of the socks were made, stated that he also had developed a dermatitis from socks which he had bought during the summer. He stated that he had purchased a pair of socks in August and after having worn them 1 day he felt a slight itching on his feet. He wore them the next day and the itching increased. He put them on a third day and developed a dermatitis with vesicles over the feet and part of the legs where the socks had come in contact with the skin. He discarded the socks and the dermatitis disappeared. He stated that he had had no skin diseases of any kind before, but that he noticed that he was sensitive to alkalis, and developed an erythema and dermatitis on his hands when he handled them. He furnished a sample of the socks for analysis. The tops, toes, and heels were of cotton, dyed black. The body of the stocking was rayon, dyed a heather green. An analysis of the dye showed that a direct black was used in dyeing the cotton, and that the rayon of the body was dyed with three dyes (in the fiber and not in the piece)—a direct blue, a direct black, and a basic green.

Patch tests were made on the patient with a piece of the black cotton top on one arm and a piece of the rayon body on the other. When the patches were removed after 48 hours, there was an erythema under the rayon patch but no reaction under the cotton patch. No late reactions developed.

In order to determine which of the dyes caused the dermatitis, the three different colored fibers in the rayon body were "teased" out and a patch of each of the fibers was placed on the patient's arm. Forty-eight hours later they were removed. The sites of the patches showed that the direct black dye and the direct blue dye "bled", but that the basic green dye did not. There were no reactions under any of the patches, and no late reactions developed. It was somewhat puzzling at the time as to why a piece of the rayon body should give a positive patch test, whereas the "teased out" fibers entering into the making of the body should not. After the assurance by the chemists that no chemical reaction can take place between the three different dyes on the fiber of the stocking while it is being worn, the only possible explanation appeared to be that in "teasing out" the

fibers of the stocking the finish on them was removed and that it was the finish that caused the dermatitis.

Information was not available as to where the socks were made and how they were finished; but as most men's socks have a sulphonated oil finish, the "teased" fibers which had given negative patch tests were immersed in a solution of Sulphoricinol S, wrung out until they were just damp, and placed on the patient's arm as a patch test. Only two of the fibers were used—the direct black and the direct blue. Because the basic green did not "bleed", it was deemed sufficient to use the other two colors. They were left on for 48 hours, at the end of which time there was a marked reaction under each patch—erythema, edema, and papules. This showed that the patient was sensitive to Sulphoricinol S (which contains sulphonated castor oil), and that it probably was the finish and not the dye on the socks that caused the dermatitis.

CASE NO.-4

This case came under the observation of Dr. George A. Clark, of Scranton, Pa. The following is from Dr. Clark's record:

The patient, W.B., purchased a pair of blue and green rayon socks for 10 cents on the 20th of May, 1933. He put them on at noon and wore them until he went to bed, about 10 o'clock, that evening. When he retired he noticed a slight burning on his feet, but attributed this to the walking that he had done during the afternoon and evening. At 2 o'clock in the morning he was awakened by severe burning and pain in his feet. He got up and soaked them in hot salt water. Later in the morning it was impossible for him to get out of bed, because both feet were badly swollen and painful. He applied cold cream and remained in bed for 2 days. On the third day he bandaged his feet and was seen by a physician, who prescribed an ointment for him, because at that time there were large blisters all over his feet, and in some places superficial areas of the skin had peeled off. He was sent to my office about the 28th of May, and the following observations were made: Both feet were markedly swollen. Many blisters were present. Those that had broken down showed large areas of excoriation of the superficial areas of the skin. This marked dermatitis extended up the leg to the middle part of the calf, where it ended abruptly. This area corresponded to that which came in contact with the sock. There was no other skin eruption over the body. The patient brought in one of the socks. Part of it was sent to Washington for analysis of the dyes used, and part was kept, from which a solution was made for a skin test. The patient was sent from the office to a photographer where pictures were taken of both legs.

On May 31 the patient returned and a cutaneous skin test was made on his left arm. There was no reaction during the 15 minutes that he remained in the office. The next day he returned and there was a marked area of hyperemia extending from his elbow to his shoulder. The arm was painful and inflamed. At the point of the cutaneous test there were innumerable small blisters. The patient felt feverish during the night, with a loss of appetite. These were the same symptoms to a lesser degree that he had for the first 3 or 4 days of the eruptions over his feet. He was unable to work for about 2½ months. Since that time he has had occasional eruptions over different parts of the body. The new eruptions appeared mostly on his hands, producing pain and breaking of the skin

FIGURE 1.—Dermatitis caused by the finish on socks (Case 4).

FIGURE 2.—Reaction from inoculation test with one drop of extract of sock (Case 4).

surface. There is a brownish discolored pigmentation over his feet and legs where the original reaction had occurred.

Dr. Clark reported this case to Medical Director G. W. McCoy, of the National Institute of Health, and in this report he stated as follows:

I do not believe it is due to the rayon, because the collar of the sock was made of cotton and the eruption continued up the leg as high as the top of the sock reached.

In order to test the patient I made an extract of half of the sock and put a drop of this on a cutaneous abrasion made on the forearm. There was not much reaction that afternoon, but the next day the patient said that he had been unable to sleep all night, because of a terrific headache, temperature, and nausea. It was the same reaction he had following the wearing of the socks the first time. When I examined his arm it was swollen from the elbow to the wrist, with ulceration and blebs around the point of inoculation with one drop. (See fig. 2.)

An analysis of the sock obtained from Dr. Clark was made, and showed the following:

The body of the stocking was dyed with the type of amino anthraquinone, and an azo yellow was also used to give the present green shade. The azo yellow may be a skin irritant, but in this case the green color did not leach off so that it seems that the green may not have been at fault. The top of the stocking was dyed a blue, and it is an atrocious piece of dyeing. It is a cheap fugitive color which comes off very easily, and is made from benzidine used as a base and coupled on the fiber with gamma acid. The blue developed is an intermediate stage and is used as a direct color only in very cheap work. The completed stage of this type of dyeing is a black. The blue dye, while cheap, has not been found to be a general irritant; and if it caused the dermatitis, then the patient must have had a hypersensitivity toward it. It is more likely, as shown from the photograph, that the part of the foot covered by the acetate silk was severely inflamed, and that something with which the hose was finished, that is, the last rinse to soften it after dyeing, was at fault. Magnesium chloride solution is often used for this last rinse. It may also be possible for the sulphonated oil which is often used as a finish to cause the dermatitis.

The photograph shows that all the skin touched by the sock was inflamed. If the dermatitis had been caused by the dye used on the cotton top, then that part of the foot which was covered by the body of the sock would not have been inflamed, whereas if the dye used on the body of the sock had been at fault that portion of the skin covered by the cotton top would not have been inflamed. The test performed, as described by Dr. Clark, was a test with "an extract of the sock", which contained not only the dye that "bled" off the cotton top but also the finish that came off the whole sock. The dye used on the rayon body, being fast, did not come off and was not in the "extract of the sock." It was, therefore, impossible to tell from this test whether it was the dye from the cotton top or whether it was the finish that was the cause of the dermatitis. However, this test, considered with the fact that all of the skin touched by the socks was

inflamed, shows that it was most likely the finish and not the dye that caused the dermatitis.

DISCUSSION

Patients in cases 2 and 3 were alkaline sensitive; and as the finishes were alkaline, it was probably the alkali in the finish used on the socks which caused the dermatitis.

When socks are suspected as being the cause of dermatitis, patch tests as described in case 2 should be performed in order to determine the actual irritant in the socks.

When the socks are dyed a solid color (in the piece) and it is desired to find out whether the dye, the finish, or the material used in the sock is at fault, patch tests should be done, as follows:

1. With a piece of the new sock;
2. With a piece of the new sock thoroughly washed and rinsed to remove the finish; and
3. With a piece of grey goods similar to that used in the sock.

When socks dyed with a number of colors are suspected of causing dermatitis, then that portion of the skin lying under the irritant color will show more inflammation than the rest of the skin, as illustrated by case 1; and patch tests made with that particular color should be positive.

In "teasing out" the fibers from a multi-colored piece of fabric the finish is usually removed, and if the finish is the cause of the dermatitis then patch tests of the teased-out fibers will be negative, although the material from which the fibers were "teased" will give a positive patch test. Wetting the "teased" fibers with the finish used on the material and then performing a patch test will give a positive result, as happened in case 3.

CONCLUSION

1. Careful investigations should be made in each case of dermatitis due to contact with dyed material to determine whether the material, the dye, or the finish is the actual irritant.
2. Allergic individuals should thoroughly wash the finish and the excess dye off new socks before wearing them.
3. A minimum amount of finishes should be used on socks by manufacturers, and these finishes should be as nearly neutral in reaction as possible.

Acknowledgments.—The author desires to express his appreciation to the Technical Laboratories of E. I. Du Pont de Nemours & Co., and to the General Dyestuff Corporation, for the chemical analyses reported in this paper.

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COURT DECISION ON PUBLIC HEALTH

City health district board of health not compelled to inspect certain sources of milk supply.—(Ohio Court of Appeals; *State ex rel. Hanna* v. *Spitler et al.*, 190 N.E. 584; decided July 1, 1933.) The council of the city of Findlay adopted an ordinance which, among other things, required a permit for the sale of milk and milk products in the city and provided for an inspection of the sources of milk sold therein. The plaintiff had for a number of years been engaged in selling at retail and distributing milk and milk products in Findlay. He had procured his supply from a company in that city, but, when this company discontinued its milk business, he procured his product from a company whose sources of supply were not in, or adjacent to the boundary lines of, Hancock County in which the city of Findlay was located. The plaintiff applied to the board of health of the city of Findlay health district for a permit to continue his business, and the

offer was made to pay the reasonable expenses of such board in making inspections of plaintiff's sources of milk supply. The board rejected the plaintiff's application for a permit and he brought an action in mandamus in the court of appeals to compel the board to cause an inspection to be made of his sources of milk supply and to act thereon in accordance with the city ordinance. It was stipulated by the parties that the only question for determination by the court was whether the defendants had the right to refuse to make inspections at the expense of the plaintiff of sources of milk supply not within, or adjacent to the boundary lines of, Hancock County under the terms and provisions of the city ordinance.

The court stated the rule that mandamus did not lie to compel the performance of an act which was not specially enjoined by law as a duty resulting from an office, trust, or station. It further stated that it found no provision of law making a board of health of a city health district subject or amenable in any way to the government of the municipality with which the district was coextensive, except that appointments of board members were made by the mayor of such municipality, and such board, under the law, constituted a governmental agency separate and distinct from, and not in any way subject to the jurisdiction of, such municipality.

The constitutional and statutory provisions pertinent to the case were reviewed by the court, which then said:

> By the constitutional provision above mentioned, the power of municipalities to adopt and *enforce* sanitary and other similar regulations is restricted to the *limits of such municipality*, and the same restriction in reason applies to similar powers delegated to a municipality by the legislature, so it cannot be said that any act incidental to the enforcement of such regulation which cannot be done within the limits of such municipality is specifically enjoined by law on any officer as a duty resulting from an office, trust, or station.

Judgment was entered for the defendants, the court concluding its opinion as follows:

> As under the provisions of the General Code above mentioned power is specifically conferred upon a board of health of a municipal health district to adopt regulations similar to the subject-matter of the ordinance adopted by the municipal council in the instant case, which under the law such board of health in its discretion may or may not exercise, and such city district board of health constitutes a separate and distinct government agency which is not required by law to enforce the provisions of an ordinance of the city the boundaries of which are coextensive with such health district covering the same subject-matter, there is no duty on the part of such board under such ordinance the performance of which can be compelled by mandamus.

DEATHS DURING WEEK ENDED SEPTEMBER 15, 1934

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Sept. 15, 1934	Corresponding week, 1933
Data from 86 large cities of the United States:		
Total deaths	7,074	6,833
Deaths per 1,000 population, annual basis	9.9	9.5
Deaths under 1 year of age	506	483
Deaths under 1 year of age per 1,000 estimated live births	47	[1] 41
Deaths per 1,000 population, annual basis, first 37 weeks of year	11.5	11.0
Data from industrial insurance companies:		
Policies in force	67,263,250	67,772,681
Number of death claims	11,176	11,835
Death claims per 1,000 policies in force, annual rate	8.7	9.1
Death claims per 1,000 policies, first 37 weeks of year, annual rate	10.1	9.9

[1] Data for 81 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended Sept. 22, 1934, and Sept. 23, 1933

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Sept. 22, 1934, and Sept. 23, 1933

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933
New England States:								
Maine					1		1	0
New Hampshire							0	0
Vermont							0	0
Massachusetts	5	8			8	19	2	0
Rhode Island		1				1	1	0
Connecticut	3	1	3	1	9	4	0	1
Middle Atlantic States:								
New York	14	32	[1] 6	[1] 6	52	53	0	1
New Jersey	4	8	6	4	11	5	1	4
Pennsylvania [2]	26	22			74	18	0	2
East North Central States:								
Ohio	32	38	4	12	14	12	1	0
Indiana	33	47	15	33	29		0	1
Illinois	40	31	13	6	31	12	6	3
Michigan	5	12		1	9	10	1	1
Wisconsin	3	1	10	10	52	14	1	0
West North Central States:								
Minnesota	6	4	2		18	4	1	1
Iowa [2]	6	11			5		1	0
Missouri	45	44	38	12	13	6	2	0
North Dakota	5	6	1		15	7	1	0
South Dakota		4			1	3	0	0
Nebraska	3					1	1	0
Kansas	10	9			5	5	0	0
South Atlantic States:								
Delaware						2	0	0
Maryland [2]	13	7	28	5	6	3	0	1
District of Columbia	10	4				2	0	1
Virginia	34	64			6	12	1	2
West Virginia	44	54	20	15	12	10	1	4
North Carolina	65	117	3	44	17	39	1	1
South Carolina	13	28	132	131	2	25	0	3
Georgia [2]	30	45				21	2	0
Florida [2]	8	5	3		1	3	0	0

Footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Sept 22, 1934, and Sept. 23, 1933—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933
East South Central States:								
Kentucky	36	78			32		1	1
Tennessee	64	65	15	14	13	3	0	0
Alabama [2]	54	56	10	10	20	20	0	0
Mississippi [2]	22	25					1	0
West South Central States:								
Arkansas	9	26	2	4		6	0	0
Louisiana [2]	22	12	7	8	11	6	0	2
Oklahoma [4]	7	50	28	2	1	1	0	4
Texas [2]	44	83	38	107	5	15	0	2
Mountain States:								
Montana	2	2	14	1	1	2	1	0
Idaho	2			2	1		0	0
Wyoming	1					1	0	0
Colorado	5	4			16	19	1	1
New Mexico		8	1		10	1	0	0
Arizona		3	8		3	1	0	0
Utah [2]		1			1	2	0	0
Pacific States:								
Washington	1	3			15	45	0	0
Oregon	1	3	20	5	5	9	0	0
California	19	31	15	27	44	119	0	3
Total	746	1,053	442	460	569	541	29	39

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933
New England States:								
Maine	1	15	11	7	0	0	2	2
New Hampshire	0	0	6	3	0	0	0	0
Vermont	0	1	6	1	0	0	1	0
Massachusetts	2	19	79	76	0	0	9	3
Rhode Island	0	1	5	15	0	0	2	0
Connecticut	0	10	8	15	0	0	3	4
Middle Atlantic States:								
New York	19	84	112	111	0	0	31	45
New Jersey	4	21	39	30	0	0	13	8
Pennsylvania [2]	6	26	122	125	0	0	58	51
East North Central States:								
Ohio	16	20	193	149	3	0	30	51
Indiana	3	1	66	71	0	0	19	15
Illinois	9	12	188	136	0	0	56	27
Michigan	20	3	76	121	0	0	15	22
Wisconsin	6	2	98	27	1	4	3	0
West North Central States:								
Minnesota	1	36	42	38	0	0	1	2
Iowa [2]	1	5	39	19	0	0	18	4
Missouri	2	3	30	52	0	1	17	27
North Dakota	2	8	12	16	1	0	3	3
South Dakota	2	2	3	2	0	0	1	2
Nebraska	0	1	12	19	2	0	1	3
Kansas	6	5	29	69	0	0	10	9
South Atlantic States:								
Delaware	0	0	2	4	0	0	2	1
Maryland [2]	1	4	29	17	0	0	28	13
District of Columbia	0	1	8	9	0	0	5	5
Virginia	1	2	47	57	0	0	43	25
West Virginia	5	5	91	82	0	0	58	55
North Carolina	0	2	83	57	1	0	9	16
South Carolina	0	1	13	11	0	0	24	22
Georgia [2]	3	2	16	13	0	0	23	37
Florida [2]	0	0	5	3	0	0	2	3

Footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Sept. 22, 1934, and Sept. 23, 1933—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933	Week ended Sept. 22, 1934	Week ended Sept. 23, 1933
East South Central States:								
Kentucky	1	0	58	91	0	0	62	47
Tennessee	1	0	59	43	0	0	42	38
Alabama [2]	2	0	18	49	0	0	30	20
Mississippi [3]	1	1	19	17	0	0	7	6
West South Central States:								
Arkansas	0	1	6	4	0	0	6	9
Louisiana [2]	0	1	13	14	0	0	15	16
Oklahoma [4]	0	1	9	26	0	1	21	41
Texas [2]	3	0	24	26	8	1	65	48
Mountain States:								
Montana	11	3	9	10	1	0	7	8
Idaho	6	0	6	2	0	1	9	0
Wyoming	2	3	4	1	0	0	0	1
Colorado	2	0	25	7	1	0	5	19
New Mexico	1	1	7	2	0	1	14	6
Arizona	2	0	10	5	0	0	3	2
Utah [3]	2	1	10	6	0	0	3	0
Pacific States:								
Washington	71	4	18	12	6	1	6	5
Oregon	6	2	21	14	0	1	7	8
California	53	4	96	116	0	3	16	6
	274	314	1,882	1,800	24	14	805	735

[1] New York City only.
[2] Typhus fever, week ended Sept. 22, 1934, 53 cases, as follows: Pennsylvania, 1; Georgia, 19; Florida, 1; Alabama, 15; Louisiana, 1; Texas, 16.
[3] Week ended earlier than Saturday.
[4] Exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
August 1934										
Idaho	3	2	3	-------	7	-------	45	10	0	42
Illinois	28	87	42	47	301	-------	69	347	1	212
Maine	0	5	-------	-------	9	1	4	19	0	14
Michigan	4	30	1	27	98	-------	55	256	4	80
Minnesota	1	30	1	1	64	-------	26	71	12	35
New York	10	78	-------	10	362	-------	45	415	0	126
Ohio	8	64	61	12	202	-------	70	382	1	215
Rhode Island	1	4	-------	-------	37	-------	0	20	0	3
South Carolina	-------	136	261	919	46	115	4	8	0	111
Tennessee	4	28	38	922	69	16	17	64	0	279
Texas	3	166	116	2,704	123	76	18	108	11	258
Virginia	3	56	197	49	161	19	23	95	0	141
West Virginia	4	75	133	2	79	1	28	100	0	164
Wisconsin	3	20	70	-------	523	-------	23	156	20	43

August 1934

	Cases
Actinomycosis:	
Illinois	1
Chicken pox:	
Idaho	3
Illinois	84
Maine	36
Michigan	86
Minnesota	35
New York	233
Ohio	58
Rhode Island	4
South Carolina	2
Tennessee	8
Texas	40
Virginia	10
West Virginia	9
Wisconsin	113
Dengue:	
South Carolina	1
Texas	8
Devil's grippe (Dabney's grippe):	
Virginia	930
Diarrhea:	
South Carolina	297
Diarrhea and dysentery:	
Virginia	1,070
Diarrhea and enteritis:	
Ohio (under 2 years)	51
Dysentery:	
Illinois (amoebic)	35
Illinois (amoebic carriers)	110
Illinois (bacillary)	30
Michigan	3
Minnesota (amoebic)	8
Minnesota (bacillary)	10
New York (amoebic)	3
New York (bacillary)	91
Ohio	5
South Carolina (amoebic)	2
Tennessee	44
Texas	101
Virginia (amoebic)	1
West Virginia	19
Food poisoning:	
Ohio	16
German measles:	
Illinois	22
Maine	4
Michigan	17
New York	62
Ohio	11
Rhode Island	3
Tennessee	3
Wisconsin	51
Hookworm disease:	
South Carolina	53
Impetigo contagiosa:	
Idaho	2
Illinois	5
Michigan	3
Tennessee	13

August 1934—Continued

	Cases
Jaundice, epidemic:	
Minnesota	6
Lead poisoning:	
Illinois	1
Ohio	12
Lethargic encephalitis:	
Illinois	89
Minnesota	1
New York	10
Ohio	36
South Carolina	3
Virginia	4
Wisconsin	2
Mumps:	
Idaho	1
Illinois	151
Maine	12
Michigan	62
Ohio	66
Rhode Island	1
South Carolina	30
Tennessee	22
Texas	30
Wisconsin	45
Ophthalmia neonatorum:	
Illinois	3
New York	6
Ohio	78
South Carolina	2
Wisconsin	1
Paratyphoid fever:	
Illinois	15
Maine	1
Michigan	5
New York	8
Ohio	6
Rhode Island	4
South Carolina	3
Tennessee	7
Texas	17
Virginia	3
Puerperal septicemia:	
Illinois	2
Ohio	2
Rabies in animals:	
Illinois	28
Maine	1
New York [1]	4
South Carolina	32
Rabies in man:	
Maine	1
New York	2
Rocky Mountain spotted fever:	
Idaho	1
New York	2
Virginia	12
Scabies:	
Tennessee	2
Septic sore throat:	
Illinois	25
Michigan	17
New York	65
Ohio	106

August 1934—Continued

	Cases
Septic sore throat—Con.	
Rhode Island	2
Tennessee	2
Virginia	4
Tetanus:	
Illinois	6
Michigan	1
New York	10
Ohio	1
Tennessee	2
Virginia	7
Trachoma:	
Illinois	2
Minnesota	1
Ohio	2
Tennessee	18
Virginia	2
Wisconsin	2
Trichinosis:	
Illinois	1
New York	10
Tularaemia:	
Illinois	1
Michigan	2
Texas	2
Virginia	3
Wisconsin	1
Typhus fever:	
Illinois	8
New York	1
South Carolina	2
Texas	108
Undulant fever:	
Illinois	8
Maine	3
Michigan	12
Minnesota	11
New York	25
Ohio	21
Tennessee	2
Virginia	3
Wisconsin	5
Vincent's infection:	
Illinois	59
Maine	2
Michigan	7
New York [1]	74
Tennessee	7
Whooping cough:	
Idaho	28
Illinois	1,011
Maine	128
Michigan	851
Minnesota	148
New York	1,875
Ohio	724
Rhode Island	158
South Carolina	91
Tennessee	265
Texas	455
Virginia	336
West Virginia	367
Wisconsin	1,055

[1] Exclusive of New York City.

DENGUE IN SOUTHEASTERN STATES

During the week ended September 22, 1934, 40 cases of dengue were reported in Georgia.

A telegram from Miami, Fla., dated September 21, stated that it was estimated that there were approximately 1,000 cases of dengue in the city. The *Aëdes* index was decreasing, and conditions showed marked improvement.

Cases of dengue were reported in various localities in Florida, during the week ended September 22, as follows:

Locality	County	Number of cases	Locality	County	Number of cases
Coral Gables	Dade	1	Miami	Dade	78
Everglades	do	1	Pompano	Broward	2
Fort Lauderdale	Broward	2	St. Augustine	St. Johns	2
Hastings	St. Johns	1	West Palm Beach	Palm Beach	1
Hialeah	Dade	1			

The age distribution of the above cases was as follows:

Under 1 year	0	35–49	11
1–5	1	50–69	16
6–13	8	Over 70	5
14–17	2	Not stated	22
18–34	24		

WEEKLY REPORTS FROM CITIES

City reports for week ended Sept. 15, 1934

[This table summarizes the reports received regularly from a selected list of 121 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference]

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0		0	0	0	0	0	1	5	2	14
New Hampshire:											
Concord	0		0	0	0	1	0	0	1	0	4
Nashua	0			0		2	0		0	0	
Vermont:											
Barre											
Burlington	0		0	1	0	0	0	0	0	0	7
Massachusetts:											
Boston	1		0	2	11	16	0	9	4	32	184
Fall River	1		1	1	0	0	0	3	0	12	32
Springfield	0		1	1	0	3	0	0	0	7	38
Worcester	1		0	1	5	2	0	1	0	6	33
Rhode Island:											
Pawtucket	0		0	0	0	0	0	0	0	0	8
Providence	0		0	2	6	4	0	1	0	33	61
Connecticut:											
Bridgeport	0	2	1	0	0	0	0	1	0	2	30
Hartford	0		0	6	1	2	0	2	1	0	40
New Haven	0	3	0	2	0	0	0	0	1	7	26
New York:											
Buffalo	0		0	1	2	10	0	2	0	29	94
New York	13	3	2	17	68	33	0	87	23	244	1,193
Rochester	1		0	1	1	3	0	2	0	3	64
Syracuse	0		0	0	2	6	0	0	0	36	38

City reports for week ended Sept. 15, 1934—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
New Jersey:											
Camden	0		0	0	2	2	0	0	0	7	35
Newark	0	4	0	2	2	4	0	11	2	38	74
Trenton	0		0	0	0	0	0	1	0	5	33
Pennsylvania:											
Philadelphia	5		1	3	10	8	0	27	5	146	368
Pittsburgh	4		0	7	14	8	0	6	8	29	148
Reading	0		0	0	0	1	0	1	0	20	25
Scranton	0			1		1	0		0	8	
Ohio:											
Cincinnati	3		0	0	3	17	0	4	0	5	118
Cleveland	3	9	0	1	8	7	0	13	2	36	178
Columbus	1	2	2	0	2	17	0	6	1	16	91
Toledo	1	1	1	0	4	7	0	5	0	14	78
Indiana:											
Fort Wayne											
Indianapolis	3		0	0	4	8	0	2	1	13	
South Bend	0		0	0	0	2	0	0	1	0	
Terre Haute	0		0	0	3	0	0	0	0	0	12
Illinois:											
Chicago	2	1	2	8	40	63	0	34	5	26	686
Springfield	0	1	1	1	2	1	0	0	3	0	28
Michigan:											
Detroit	2		1	7	5	20	0	18	3	61	192
Flint	0		0	0	2	4	0	0	0	6	21
Grand Rapids	0		0	1	0	3	0	1	0	1	26
Wisconsin:											
Kenosha	0		0	2	0	1	0	0	0	4	6
Milwaukee	3		0	3	3	34	0	1	0	39	80
Racine	0		0	0	0	1	0	0	0	6	12
Superior	0		0	0	0	0	0	0	0	0	6
Minnesota:											
Duluth	0		0	1	0	0	0	1	0	3	18
Minneapolis	1		0	6	3	1	0	0	1	7	90
St. Paul	0		0	0	3	2	0	2	2	15	56
Iowa:											
Davenport	0			0		1	0		0	0	
Des Moines	0			0		7	0		12	0	32
Sioux City	1			0		2	0		0	1	
Waterloo	1			1		0	0		0	2	
Missouri:											
Kansas City	1		0	0	1	2	0	3	0	0	82
St. Joseph	3		0	0	2	1	0	1	0	1	42
St. Louis	6		1	0	3	12	0	13	8	9	176
North Dakota:											
Fargo	0		0	1	0	1	0	0	0	15	8
Grand Forks	0			0		0	0		0	3	
South Dakota:											
Aberdeen	0			0		1	0		0	9	
Nebraska:											
Omaha	2		0	0	2	5	1	1	0	2	33
Kansas:											
Topeka	0		0	0	1	1	0	0	0	0	10
Wichita	0		0	1	2	4	0	0	0	0	24
Delaware:											
Wilmington	1		0	0	0	2	0	0	0	7	33
Maryland:											
Baltimore	2	3	0	2	12	5	0	13	0	57	169
Cumberland											
Frederick	0		0	0	0	0	0	0	0	0	3
District of Columbia:											
Washington	1		0	2	4	11	0	9	3	10	142
Virginia:											
Lynchburg	4		0	1	1	1	0	2	1	0	16
Norfolk											
Richmond	0		0	0	2	2	0	5	0	1	41
Roanoke	6		0	0	0	4	0	2	1	1	24
West Virginia:											
Charleston	4		0	0	0	7	0	1	3	6	3
Huntington	6			0		2	0		0	0	
Wheeling	0		0	0	0	7	0	0	1	3	16
North Carolina:											
Raleigh	0		0	0	1	1	0	0	0	1	13
Wilmington	0		0	0	1	0	0	0	1	2	11
Winston-Salem	4	1	0	0	3	8	0	1	0	6	20

City reports for week ended Sept. 15, 1934—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
South Carolina:											
Charleston	0	18	0	0	0	1	0	2	3	0	19
Columbia	0	----	0	0	0	0	0	0	0	0	16
Greenville	0	----	----	0	----	0	0	----	0	1	----
Georgia:											
Atlanta	9	4	0	0	5	9	0	2	2	7	88
Brunswick	0	----	0	0	0	0	0	0	0	0	5
Savannah	0	1	0	0	2	1	0	2	3	0	37
Florida:											
Miami	1	1	0	0	1	0	0	4	0	7	31
Tampa	0	----	0	0	0	1	0	1	0	0	18
Kentucky:											
Ashland	0	----	----	0	----	0	0	----	3	4	----
Lexington	0	----	0	0	1	1	0	1	0	0	17
Louisville	9	1	0	2	2	3	0	3	0	9	62
Tennessee:											
Memphis	0	----	0	0	5	1	0	4	4	2	88
Nashville	3	----	0	0	2	3	0	3	7	4	47
Alabama:											
Birmingham	5	----	0	0	2	8	0	2	5	3	49
Mobile	4	----	1	0	2	1	0	2	1	0	31
Montgomery	0	----	----	0	----	0	0	----	1	0	----
Arkansas:											
Fort Smith	0	----	----	0	----	0	0	----	0	0	----
Little Rock	0	----	0	0	3	0	0	2	0	0	6
Louisiana:											
New Orleans	10	1	1	1	10	4	0	8	2	0	146
Shreveport	0	----	0	0	2	0	0	3	0	2	44
Oklahoma:											
Oklahoma City	1	4	1	0	5	1	0	0	0	1	36
Tulsa	0	----	----	0	----	0	0	----	5	8	----
Texas:											
Dallas	3	----	0	0	2	4	0	2	0	0	49
Fort Worth	1	----	0	0	1	1	0	4	0	0	27
Galveston	0	----	0	0	0	0	0	0	0	0	8
Houston	4	----	0	0	0	2	0	1	1	0	62
San Antonio	0	----	0	0	3	2	0	3	0	0	39
Montana:											
Billings	0	----	0	0	0	0	0	0	0	0	6
Great Falls	0	----	0	0	0	0	0	0	0	2	6
Helena	0	----	0	0	0	1	0	0	0	0	1
Missoula	0	----	0	0	1	0	0	0	0	0	7
Idaho:											
Boise	0	----	0	0	0	0	0	1	0	0	12
Colorado:											
Denver	2	37	0	0	3	11	0	0	0	2	52
Pueblo	0	----	0	0	3	1	0	0	1	0	11
New Mexico:											
Albuquerque	0	----	0	0	0	1	0	6	0	1	13
Utah:											
Salt Lake City	0	----	0	3	2	3	0	1	0	26	29
Nevada:											
Reno	----	----	----	----	----	----	----	----	----	----	----
Washington:											
Seattle	0	----	0	2	4	2	2	5	0	13	87
Spokane	0	----	0	1	1	1	0	0	0	7	25
Tacoma	0	----	0	1	1	0	0	0	0	1	17
Oregon:											
Portland	0	----	1	1	4	5	0	2	1	0	80
Salem	0	----	----	0	----	0	0	----	0	0	----
California:											
Los Angeles	3	8	1	5	3	12	0	22	2	17	301
Sacramento	0	----	0	1	2	1	0	0	1	6	32
San Francisco	1	----	1	8	8	3	0	8	0	9	144

City reports for week ended Sept. 15, 1934—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	0	0	2
Springfield	0	0	1
New York:			
Buffalo	0	0	7
New York	2	1	3
New Jersey:			
Newark	0	0	2
Pennsylvania:			
Philadelphia	1	0	3
Pittsburgh	0	0	2
Reading	0	0	1
Scranton	1	0	0
Ohio:			
Cincinnati	0	1	0
Cleveland	0	0	2
Columbus	0	0	1
Toledo	0	0	2
Illinois:			
Chicago	5	3	4
Michigan:			
Detroit	0	0	4
Flint	0	0	1
Grand Rapids	0	0	2
Wisconsin:			
Milwaukee	1	0	2
Minnesota:			
Minneapolis	0	0	1
St. Paul	0	0	1
Missouri:			
Kansas City	0	0	1
St. Joseph	0	0	1
St. Louis	1	0	0
Maryland:			
Baltimore	0	0	2
Alabama:			
Birmingham	1	0	0
Texas:			
Houston	0	0	1
San Antonio	0	0	1
Montana:			
Billings	0	0	1
Washington:			
Seattle	0	0	10
Spokane	0	0	9
Tacoma	0	0	2
California:			
Los Angeles	0	0	32
Sacramento	0	0	1
San Francisco	1	1	0

Dengue.—Cases: Savannah, 3; Miami, 92; Birmingham, 1.
Lethargic encephalitis.—Cases: New York, 1; Cincinnati, 1; Cleveland, 1; Toledo, 8; Indianapolis, 3; Chicago, 2; Springfield, Ill., 1; St. Louis, 2.
Pellagra.—Cases: Springfield, Mass., 1; Charleston, S.C., 1; Savannah, 2; Miami, 2; New Orleans, 1.
Rabies in man.—Deaths: Nashville, Tenn., 1.
Typhus fever.—Cases: Savannah, 9; Mobile, 1; Dallas, 1; Fort Worth, 1. Deaths: Savannah, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended September 8, 1934.—During the 2 weeks ended September 8, 1934, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario [1]	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis					1					1
Chicken pox		2		16	20	15	25	20	12	110
Diphtheria		4	4	20	3	10	18	1	4	64
Dysentery					1				21	22
Erysipelas				12	1	2	4	1	1	21
Influenza		25			2				8	35
Measles		9		82	14	16	22	2		145
Mumps					10	2		1	7	20
Paratyphoid fever					7					7
Pneumonia		1			3		1		2	7
Poliomyelitis			1	16	11			3	3	34
Scarlet fever		21	6	104	18	29	13	6	33	230
Trachoma									13	13
Tuberculosis	6	3	24	105	12	12	43	3	23	231
Typhoid fever			4	55	16		7	3	7	92
Undulant fever				2	1					3
Whooping cough		10	1	289	76	23	30	18	46	493

[1] No report was received from Ontario for the week ended Sept. 8, 1934.

Vital statistics—First quarter 1934—Comparative.—The Bureau of Statistics of the Dominion of Canada has published the following statistics for the first quarter of 1934. The rates are computed on an annual basis. There were 20.2 live births per 1,000 population during the quarter in 1934 and 21.6 per 1,000 in the same quarter of 1933. The death rate was 9.9 per 1,000 population for the first quarter of 1934 and 10.8 for the first quarter of 1933. The infant mortality for the first quarter of 1934 was 73.7 per 1,000 live births and 83.7 in the corresponding period of 1933. The maternal death rate was 5.7 per 1,000 live births in the first quarter of 1934 and 5.1 in the corresponding period of 1933.

The accompanying tables give the numbers of births, deaths, and marriages for the first quarter of 1934, and deaths from certain causes by Provinces for the first quarter of 1934, and the corresponding quarter of 1933:

Numbers of births, deaths, and marriages

Province	Live births	Deaths (exclusive of still-births)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada [1]	53,862	26,419	3,971	308	11,091
Prince Edward Island	430	283	29	----	85
Nova Scotia	2,732	1,696	230	21	584
New Brunswick	2,454	1,211	207	15	383
Quebec	18,631	8,038	1,725	113	2,171
Ontario	15,325	9,511	952	93	4,200
Manitoba	3,312	1,278	210	10	783
Saskatchewan	4,834	1,429	266	27	894
Alberta	3,795	1,323	242	19	1,158
British Columbia	2,349	1,650	110	10	833

[1] Exclusive of Yukon and the Northwest Territories.

Deaths from certain causes in Canada for the first quarter of 1933 and 1934, and by Provinces for the first quarter of 1934

Cause of death	Canada [1] (first quarter)		Province—First quarter 1934								
	1933	1934	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Automobile accidents	148	107	----	5	----	15	64	4	3	5	11
Cancer	2,586	2,584	19	178	100	638	977	161	141	144	226
Diarrhea and enteritis	530	499	2	10	5	323	86	21	23	19	10
Diphtheria	68	71	2	5	2	36	7	11	3	5	----
Diseases of the arteries	1,895	2,034	10	112	69	418	1,072	94	73	80	106
Diseases of the heart	4,171	4,482	39	250	191	1,083	2,025	179	195	196	324
Homicide	36	32	----	1	2	8	11	1	1	4	4
Influenza	2,613	791	8	51	36	270	273	26	41	47	39
Measles	47	27	----	----	1	16	1	4	4	1	----
Nephritis	1,437	1,513	22	113	41	614	466	55	75	55	72
Pneumonia	2,374	2,274	31	160	132	696	817	112	117	81	128
Poliomyelitis	14	7	----	----	----	3	1	----	2	----	1
Puerperal causes	----	308	----	21	15	113	93	10	27	19	10
Scarlet fever	58	55	1	4	----	21	23	2	----	1	3
Smallpox	2	2	----	----	----	----	----	----	----	----	2
Suicide	206	190	1	6	1	26	68	14	18	24	32
Tuberculosis	1,835	1,615	30	136	60	673	338	93	67	83	135
Typhoid fever	45	63	1	----	1	49	4	----	5	2	1
Violent deaths	859	908	6	55	36	209	353	50	56	68	75

[1] Exclusive of Yukon and the Northwest territories.

CHINA

Shanghai—Cholera.—According to a report dated August 13, 1934, 3 cases of cholera had occurred in Shanghai, 1 on July 16, 1 on July 17, and 1 on July 28, 1934. The prophylactic measures mentioned in the note on page 1072 of the PUBLIC HEALTH REPORTS for September 7, 1934, were being continued, and 551,617 anticholera vaccinations had been done in the city up to the end of July.

CUBA

Habana—Communicable diseases—5 weeks ended July 28, 1934.—During the 5 weeks ended July 28, 1934, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	15	4	Poliomyelitis	[1] 31	2
Malaria	[1] 166	9	Tuberculosis	25	5
Measles	1	1	Typhoid fever	[1] 20	7

[1] Includes imported cases.

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended June 30, 1934.—During the 13 weeks ended June 30, 1934, cases of certain infectious diseases were reported in England and Wales, as follows:

Disease	Cases	Disease	Cases
Diphtheria	14,123	Puerperal pyrexia	1,522
Ophthalmia neonatorum	1,145	Scarlet fever	33,028
Pneumonia	13,956	Smallpox	44
Puerperal fever	647	Typhoid fever	246

England and Wales—Vital statistics—April–June 1934.—During the second quarter ended June 30, 1934, 156,636 live births and 119,034 deaths were registered in England and Wales. The following statistics are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar General of England and Wales. The figures are provisional.

Birth and death rates in England and Wales, April–June 1934

Annual rates per 1,000 population:	
Live births	15.60
Stillbirths	.66
Deaths, all causes	11.80
Deaths from—	
Diphtheria	.09
Influenza	.14
Measles	.15
Deaths from—Continued.	
Scarlet fever	.03
Violence	.54
Whooping cough	.07
Deaths per 1,000 live births:	
Diarrhea and enteritis (under 2 years)	4.90
Deaths under 1 year	55.00

JAMAICA

Communicable diseases—4 weeks ended September 8, 1934.—During the 4 weeks ended September 8, 1934, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chicken pox	4	6	Puerperal fever		2
Diphtheria	1	2	Tuberculosis	34	77
Dysentery	6	5	Typhoid fever	22	114
Poliomyelitis	1	1			

PUERTO RICO

Notifiable diseases—4 weeks ended September 8, 1934.—During the 4 weeks ended September 8, 1934, cases of certain notifiable diseases were reported in the municipalities of Puerto Rico, as follows:

Disease	Cases	Disease	Cases
Chicken pox	19	Paratyphoid fever	1
Diphtheria	21	Pellagra	3
Dysentery	56	Puerperal fever	2
Erysipelas	4	Ringworm	2
Filariasis	4	Syphilis	28
Framboesia	1	Tetanus	9
Influenza	[1] 20,570	Tetanus, infantile	2
Malaria	1,411	Trachoma	1
Measles	31	Tuberculosis	891
Mumps	58	Typhoid fever	20
Ophthalmia neonatorum	7	Whooping cough	279

[1] Includes cases reported in a special survey.

YUGOSLAVIA

Communicable diseases—July 1934.—During the month of July 1934 certain communicable diseases were reported in Yugoslavia, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	71	6	Poliomyelitis	3	----
Cerebrospinal meningitis	9	4	Scarlet fever	250	8
Diphtheria and croup	499	37	Sepsis	8	1
Dysentery	343	31	Tetanus	45	24
Erysipelas	162	8	Typhoid fever	415	28
Measles	340	3	Typhus fever	65	2
Paratyphoid fever	23	----			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

(NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for Sept. 28, 1934, pp. 1154–1167. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued Oct. 26, 1934, and thereafter, at least for the time being, in the issue published on the last Friday of each month.)

Typhus Fever

Greece—Salonika.—Typhus fever has been reported in Salonika, Greece, as follows: 3 cases during the week ended August 11, 1934, and 3 cases during the week ended August 18, 1934.

Mexico—Saltillo.—During the week ended September 15, 1934, 2 deaths from typhus fever were reported in Saltillo, Mexico.

Yellow Fever

Niger Territory—Maradi.—During the week ended September 8, 1934, 1 case of yellow fever with 1 death was reported in Maradi, Niger Territory.

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